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MTO Granular Aggregates Summary 2011

MERO-045

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Abstract

This report provides a summary of the quantities placed and the compliance of granular aggregates tested with MTO material specifications for the 2011 construction year. Each of the following granular aggregate types are summarized in this report: Granular A, Granular B Type I, Granular B Type II, Granular B Type III, Granular M, Granular O, and SSM.

The five Regional Quality Assurance Sections submitted data from contracts that were active during the 2011 construction season, and that data was summarized in a series of tables and graphs. Provincial and regional summaries are included for the quantities placed, the number of lots and quantities that were tested, as well as the number of lots and the quantities of material that were accepted at full price, accepted at a reduced price, and rejected.

During 2011, approximately 6.62 million-tonnes of granular materials were used in MTO's road construction contracts, of which a significant proportion, i.e. 6.6%, was produced from material excavated from within the right-of-way and 9.6% from reclaimed materials. Granular A represented 51.9% of the total granular materials placed by MTO.

About 4.20 million-tonnes, or 63.4% of the total granular aggregates that were placed, were tested to determine payment adjustments for quality assurance purposes during the 2011 construction season. Based on the total granular aggregates placed, the vast majority of that tonnage, i.e. 91.6%, was accepted at full price.

Key Words	Aggregates, acceptance, granular base, granular subbase, Ontario, price adjustments, provincial summary, quality assurance.
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1.0 - Executive Summary

Each year, the Ministry of Transportation of Ontario (MTO) uses large quantities of granular aggregates for road construction purposes. This report is intended to capture the available information on the quantities and quality of granular materials supplied for road base and subbase, backfill, and other purposes.

Data sheets summarizing the quantity and quality of granular aggregates used in contracts for road construction during the 2011 construction season were received by the Soils and Aggregates Section at MTO. Based on this, approximately 6.62 million tonnes of granular aggregates were placed, of which 69.3% came from commercial sources, 14.5% came from non-commercial sources, 6.6% were produced from rock that was obtained within the ROW, and 9.6 % came from reclaimed materials (i.e. RAP and RCM).

At MTO, granular materials are specified according to standard special provision (i.e. SSP) 110S13.

Granular A represented 51.9% of the total granular aggregates placed and Granular B (i.e. types I, II and III) represented 39.8%. Granular O and SSM made up the remaining 8.3% of the total used. Granular M was not used in 2011.

Based on the QA acceptance system that was in place during 2011, approximately 4.20 million tonnes, or 63.4% of the total granular aggregates that were placed, were tested for quality assurance purposes. Most of the tonnage, i.e. 83.7%, was accepted at full price and 16.3% was accepted with an adjusted price. However, since only 63.4% of the materials placed were actually tested, 91.6% of the granular aggregates placed were accepted at full price and 8.4% placed with an adjusted price.

2.0 - Introduction

Each year, MTO uses large quantities of aggregates for the construction, rehabilitation, and maintenance of provincial highways. These aggregates are continuously sampled and tested to provide evidence that they meet the physical quality and gradation requirements that are identified by the specifications contained within the contract documents of each project. Specifications have been developed to ensure that the aggregates meet the engineering needs for the intended application and to establish administrative procedures for acceptance and payment to the contractor.

For MTO's purposes, granular aggregates may be defined as unbound aggregates which are used for a variety of road construction purposes. Within the Highway Standards Branch of MTO, the Soils and Aggregates Section is responsible for material and construction specifications for Granular A (used for base, gravel sheeting, shoulder and bedding and backfill to sewers, culverts, and other structures), Granular O (used as a permeable granular base), Granular B, Types I, II, and III (used for subbase and backfill), Granular M (used for shoulder maintenance), and SSM (for subgrade material).

This report summarizes the quantities involved and the quality assurance acceptance of the granular aggregates that were used in MTO contracts for road construction purposes during the 2011 construction season. The summaries are presented as a series of tables and graphs showing the tonnages placed and the proportions of those materials that were accepted at full price, accepted with an adjusted price, or were found to be rejectable. Although several tests are used for quality assurance purposes, only the results for gradation and percent crushed (i.e. for Granular A only) are presented here. The results of these tests have been found to vary the most and, as such, have generally been used as the basis for acceptance (and payment adjustments) of granular aggregate materials.

The main body of this report generally summarizes the data on a provincial basis with more detailed regional summaries and data presented in the Appendices.

3.0 - Background

MTO's acceptance of granular aggregates is based on test results performed on samples taken from individual lots of material. In some carry-over contracts, the gradation and other quality-related aspects of these materials, and the protocol for establishing the size of each of the lots and how they are accepted, is based on MTO's Standard Special Provision (i.e. SSP) 110S13 (MTO, 2007). However a revised version of SSP 110S13 (MTO, 2010) was created in 2010 which is now being included in all new contracts and the majority of the contracts that were summarized in this report. In either case, the SSP replaces the current version of the Ontario Provincial Standard Specification (OPSS) 1010 to meet MTO's specific requirements for Quality Assurance.

In 2009, an ®Excel-based data-gathering template, entitled "QA Granular Summary Sheet" was developed to replace an old ®Word-based form. The Granular Summary Sheets capture quantity summaries, details of the lots tested, and the disposition of those lots (i.e. such as whether they were accepted at full price, reduced price, or rejected) for all granular materials used on the contract.

These sheets were given to the Contract Administrators at the beginning of each contract. At the end of the 2011 construction year, the completed templates were then submitted back to the Soils and Aggregates Section, through the appropriate Regional Quality Assurance Office. The Soils and Aggregates Section then used a data collection and calculation system (i.e. global file) which was also developed in 2009 to automatically analyze, summarize, and present the data.

This report summarizes the quantity and quality of the granular aggregates that were used by MTO in road construction contracts during the 2011 construction season based on the summary sheets that were completed and received by the Soils and Aggregates Section before April 2012. The summaries are presented as a series of tables and graphs showing the tonnages of the aggregates that were obtained from conventional sources (i.e. pits and quarries), aggregates processed from material obtained from within the Right-Of-Way (ROW), reclaimed materials that were used, as well as how each of the individual granular types met the acceptance criteria. For the most part, the main body of this report summarizes the data on a provincial basis, with more detailed regional summaries and data presented in the Appendices.

4.0 - Quantity Summaries

During 2011, the Soils and Aggregates Section received completed QA Granular Summary Sheets from a total of 142 contracts. It should be noted that, based on information obtained elsewhere, this is likely to represent at least three-quarters of the actual quantities used by MTO for granular materials.

Each Granular Summary Sheet included the quantities of each different granular aggregate that was used on each contract on the basis of the production obtained from commercial sources, non-commercial sources, or aggregates produced from rock materials obtained from within the ROW.

For Granular A, BI, BIII, and M, the summaries also included the quantities of Reclaimed Asphalt Pavement (RAP) and/or Reclaimed Concrete Material (RCM) that were used. Although MTO also allows other waste products such as blast furnace slag, nickel slag, glass, and ceramics to be used in these granular aggregates, there was almost no reported use of any of these materials during the 2011 construction season.

4.1 - Quantities of Granular Materials by Type in 2011

Table 1 and Figure 1 summarize the total quantities of granular aggregates by type that were placed in each MTO region across the province during the 2011 construction season.

Table 1: Quantity Summary of Granular Aggregates Used by Each MTO Region in 2011

Granular Material	Kilotonnes					
	Regions					Provincial MTO Totals
	Central	Eastern	Northeastern	Northwestern	West	
Gran. A	597	357	1633	337	507	**3431**
Gran. BI	570	2	876	0	0	**1448**
Gran. BII	43	157	187	376	75	**838**
Gran. BIII	0	109	0	13	224	**346**
Gran. O	0	39	0	0	0	**39**
Gran. M	0	0	0	0	0	**0**
SSM	0	88	371	56	0	**515**
Totals (# of Contracts)	**1210 (21)**	**752 (25)**	**3067 (51)**	**782 (16)**	**806 (29)**	**6617 (142)**

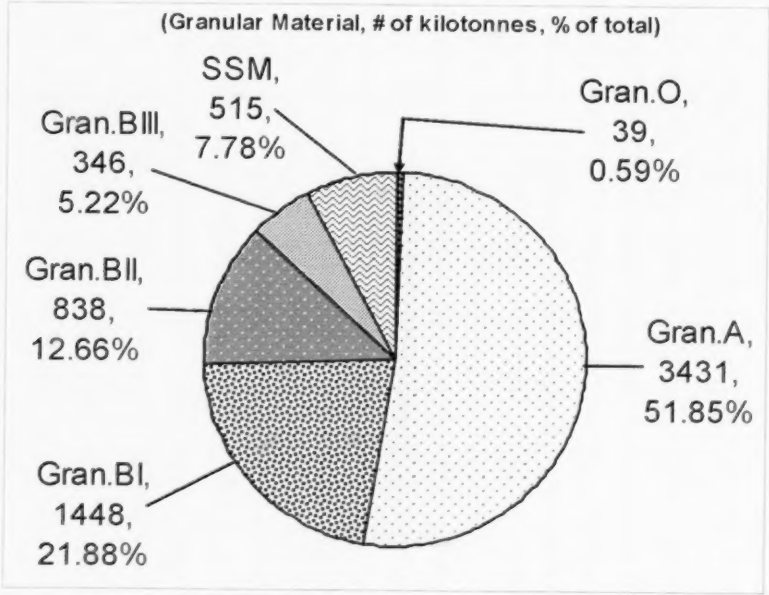


Figure 1: Total Quantities of Each Granular Aggregate Used by MTO in 2011

As shown, a total of 6.62 million-tonnes of granular aggregates were placed by MTO in 2011.

Granular A provided the largest quantity, i.e. 3.43 million-tonnes, or 51.9% of the total quantity of granular aggregates placed. This quantity includes materials coming from all possible sources, including commercial sources, non-commercial sources, aggregates produced from materials that were excavated from within the ROW, and reclaimed materials.

All three types of Granular B (Types I, II, and III) represented 2.63 million tonnes or 39.8% of the granular materials placed by MTO during 2011. SSM represented approximately 7.8% of the total granular aggregates placed (i.e. from Eastern, Northeastern and Northwestern Regions only), and Granular O represented 0.6% of the total (resulting from only 3 contracts in Eastern Region). Based on the granular summaries received, Granular M was not used in 2011.

Figure 2 shows the total quantities of all granular aggregates placed and the proportions used by each MTO region in 2011.

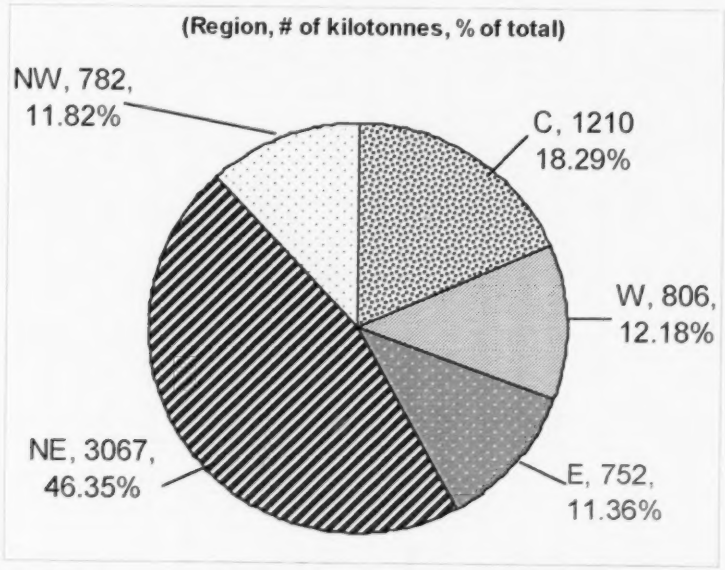
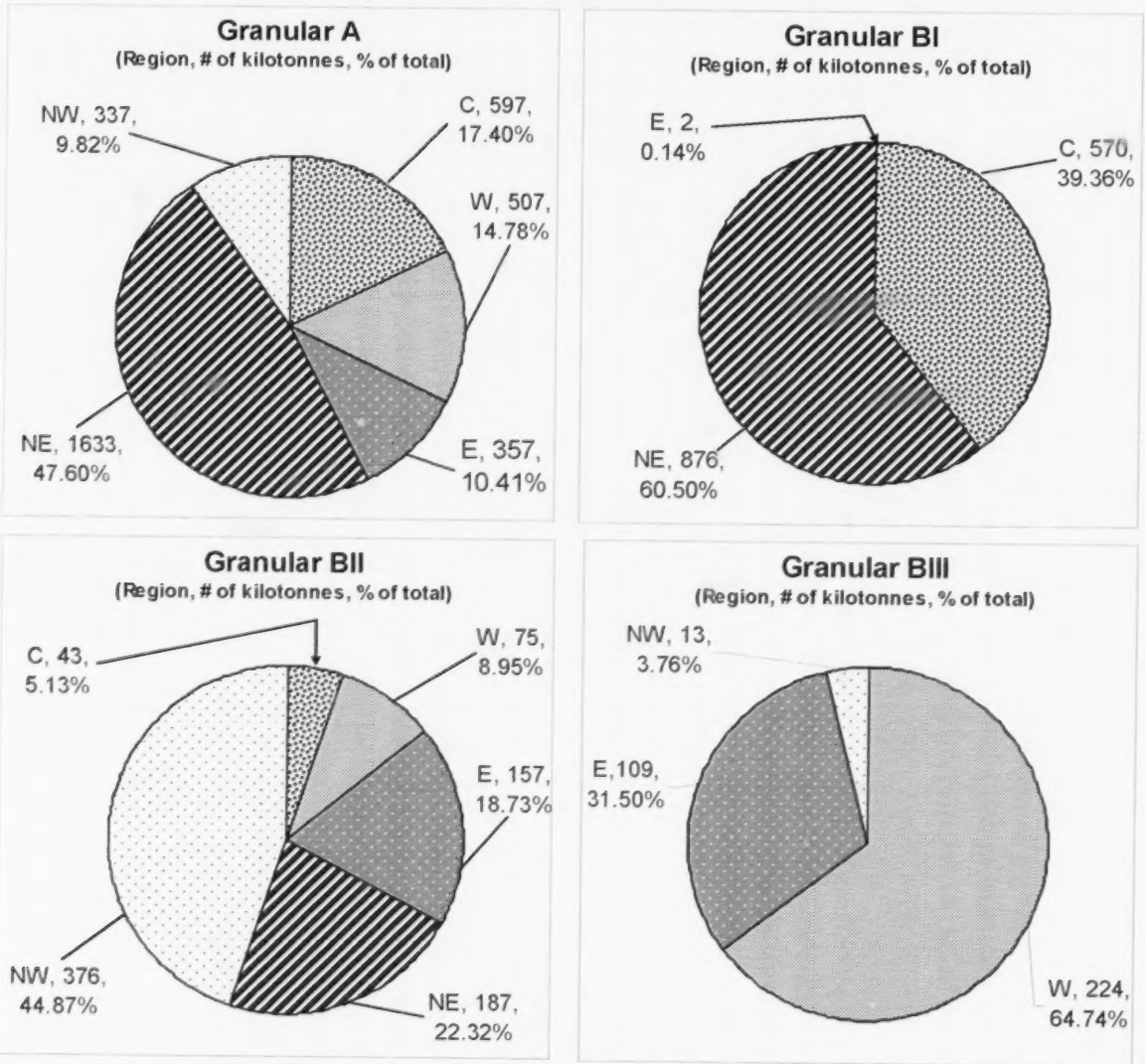


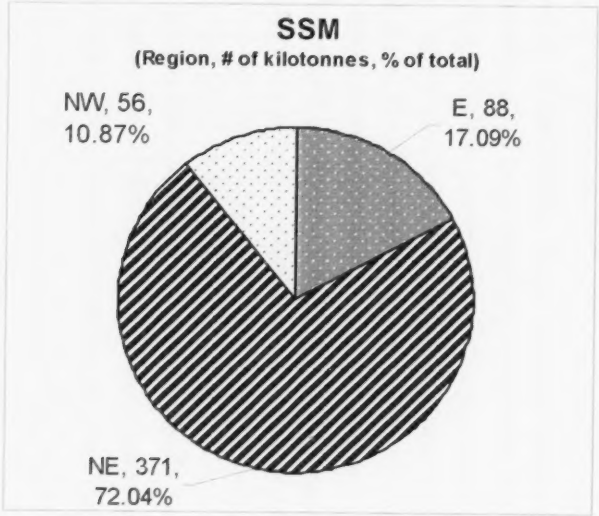
Figure 2: Total Quantities of Granular Aggregates Used by Each MTO Region in 2011

Northeastern Region used the largest quantity of granular aggregates (i.e. 3.07 million tonnes or 46.4%), followed by Central (18.3%), West (12.2%), Northwest (11.8%) and Eastern Region (11.4%).

Figure 3 shows the quantities and the percentages of each different granular aggregate (excluding Granular M and O) that were used broken down on a regional basis. Granular A was used in all five MTO regions with Northeastern placing 47.6% of the total or 1633 kilotonnes. Almost all (99.9%) of the 1448 kilotonnes of Granular BI used was placed in Central and Northeastern Regions. Northwestern, Northeastern and Eastern Regions placed 85.9% or 720 kilotonnes of Granular BII with the remainder being placed by the other two regions. Granular BIII was used in three MTO Regions with the largest percentage of the 224 kilotonnes by far being placed in West Region (64.7%) and Eastern Region (31.5%) with the remainder being placed in Northwestern Region. SSM was placed in Northeastern Region (72.0% or 371 kilotonnes), Eastern Region (17.1 or 88 kilotonnes) and Northwestern Region (10.9% or 56 kilo tonnes).

Figure 3: Quantities of Granular Aggregates Used by Each MTO Region in 2011





4.2 - Quantities by Material Source

Table 2 summarizes the total quantities of granular aggregates that were used in 2011 by each MTO region on the basis of source. These include commercial sources (i.e. licensed pits and quarries), non-commercial sources, aggregates produced from rock materials excavated from within the ROW, and reclaimed/recycled materials. Note that, in Ontario, non-commercial sources collectively refer to wayside sources, Crown sources, Letter of Approval sources, and Indian Land sources, as defined under the Aggregate Resources Act.

The detailed breakdown of these quantities by region and granular aggregate type are summarized in Appendix A. For the purposes of this report, natural aggregates include aggregates excavated from pits or produced from blasted rock in quarries or produced from within the right-of-way.

Table 2: Quantities of Natural Aggregates and Recycled Materials Used in Granular Aggregates by Each MTO Region in 2011 by Source

Source	Kilotonnes						%	
	Region					Province	Natural Aggregates or Recycled Materials	Total Granular Aggregates
	C	W	E	NE	NW	Total		
Commercial Source	759	670	733	1964	462	4588	76.7	69.3
Non-commercial Source	0	12	18	776	155	961	16.1	14.5
Material from Right-of Way	0	12	0	264	157	433	7.2	6.6
Total Natural Aggregate	759	694	751	3004	774	5982	100.0	90.4
RAP	50	111	0	60	9	230	36.2	3.4
RCM	402	0	0	0	0	402	63.2	6.1
Glass/Ceramics	0	0	0	0	0	0	0	0
Other Recycled/Reclaimed Materials	0	0	0	4	0	4	0.6	0.1
Total Recycled/Reclaimed Materials	452	111	0	64	9	636	100.0	9.6
TOTALS	**1211**	**805**	**751**	**3068**	**783**	**6617**		**100.0**

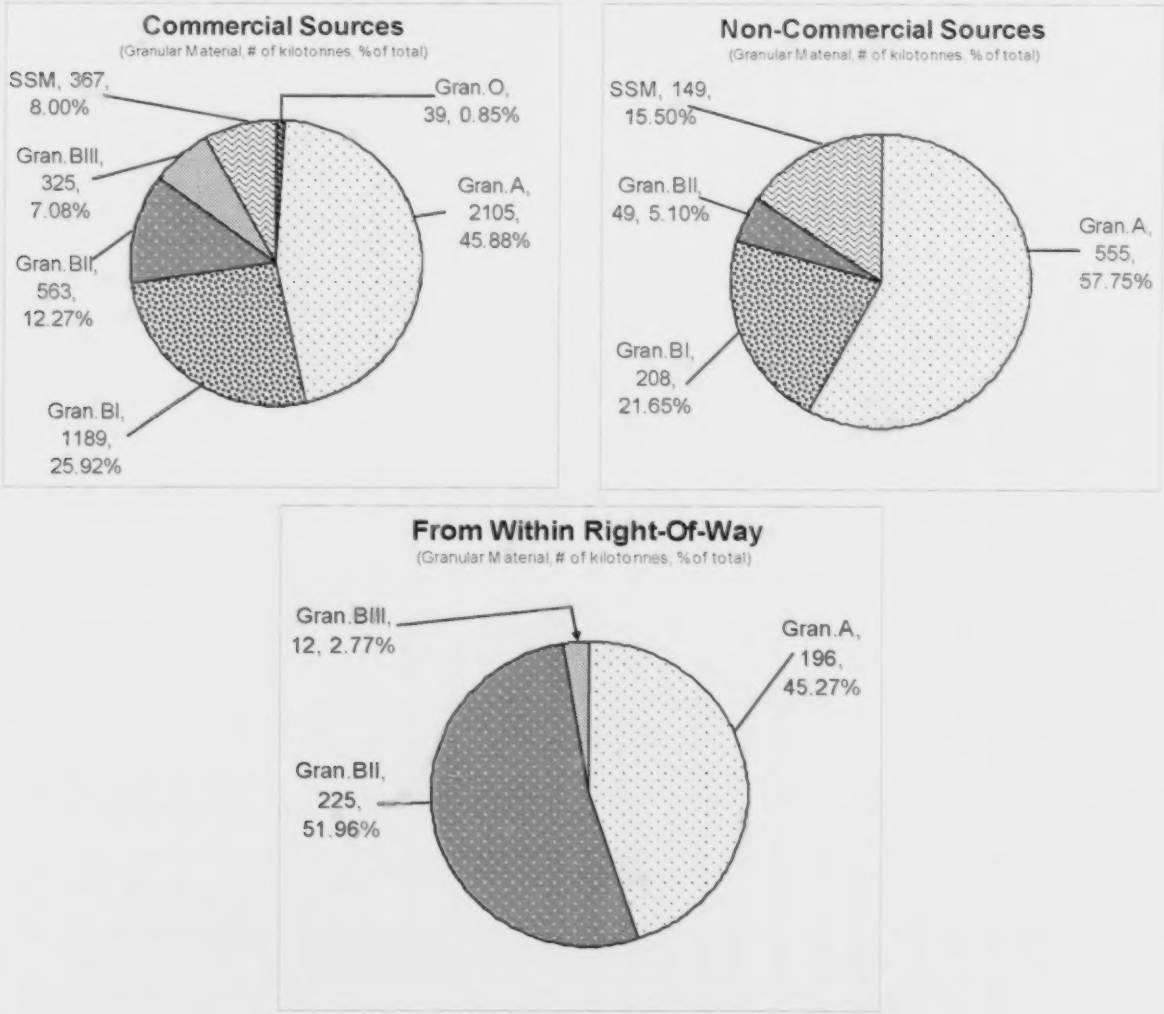
The majority of the granular aggregates used by MTO (69.3%) came from commercial sources. A small proportion of the granular aggregates used (6.6%) were also produced from rock excavated within the right-of-way (i.e. ROW). Granular aggregates produced from non-commercial sources represented 14.5% with RAP, RCM and other reclaimed materials making up the remaining 9.6% of the granular aggregates used.

Figure 4 shows the tonnages and the proportions of each granular aggregate type that were obtained from commercial sources, non-commercial sources and from rock materials excavated from within the ROW.

The aggregates used as Granular A, BII, or BIII came from all three of these sources. Granular O and M were only produced from commercial sources. Bar charts showing the quantities of each granular aggregate type that were produced from each different source on a regional basis are also presented in Appendix B.

It should be noted that over the last decade, granular materials produced from crushed rock obtained from within the ROW represented a much larger amount of material, especially in Northeastern Region during the twinning of both Highway 11 and 400 than was captured in the data from 2011. However, since Highway 11 is essentially completed, the twinning of Highway 400 is beginning to wind down and few such projects are likely to be constructed in the near term, less granular materials will likely be produced from such large ROW sources in the future.

Figure 4: Total Quantities of Granular Aggregates Used by MTO in 2011 by Source



4.3 - Recycled/Reclaimed Materials

Although MTO's specifications allow blast furnace slag, nickel slag and glass and/or ceramics to be used in Granular A, BI, BII, and M, based on the summary sheets received, Reclaimed Asphalt Pavement (RAP) and Recycled Concrete Material (RCM) represented nearly all recycled/reclaimed materials used in granular aggregates during 2011.

Figure 5 shows that a total of 636 kilotonnes of reclaimed materials were used in granular aggregates in 2011, with RCM representing 63.2% of it and RAP 36.2%.

The total quantities and the proportions used by each MTO region are presented in Figure 6. Central and West Region used 88.5% or 563 kilotonnes of the total recycled/reclaimed materials used

in granular aggregates while Northeastern and Northwestern Regions used the remaining 73 kilotonnes of recycled/reclaimed construction materials.

It should be noted that, although it es recognized that full-depth reclamation (FDR) is a process that is used by MTO, which significantly reduces the need for granular aggregates. since FDR is done in-place, and the aggregates produced are not actually used as a component in a particular granular aggregate type, it has not been dealt with in this report.

Figure 5:

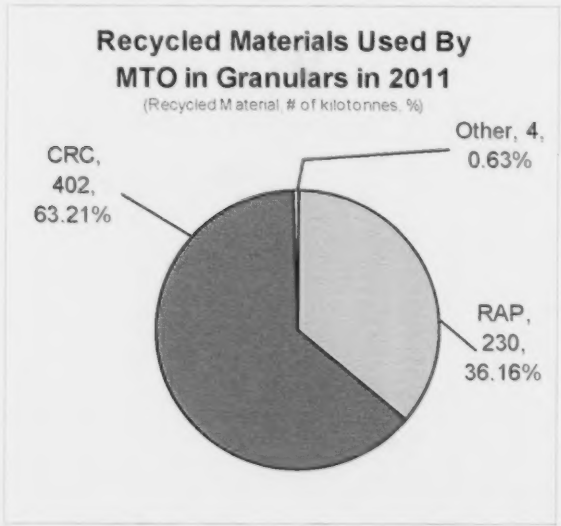
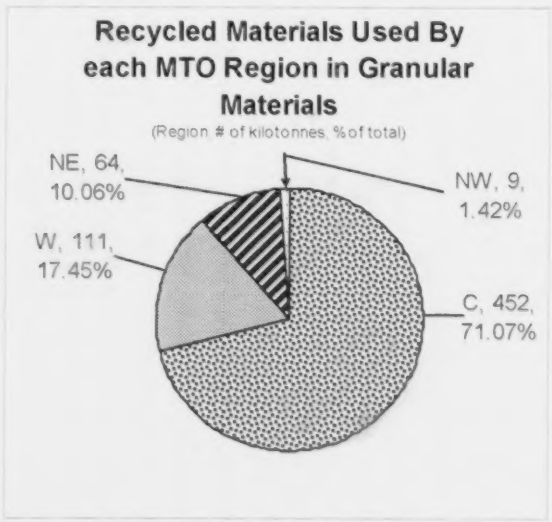


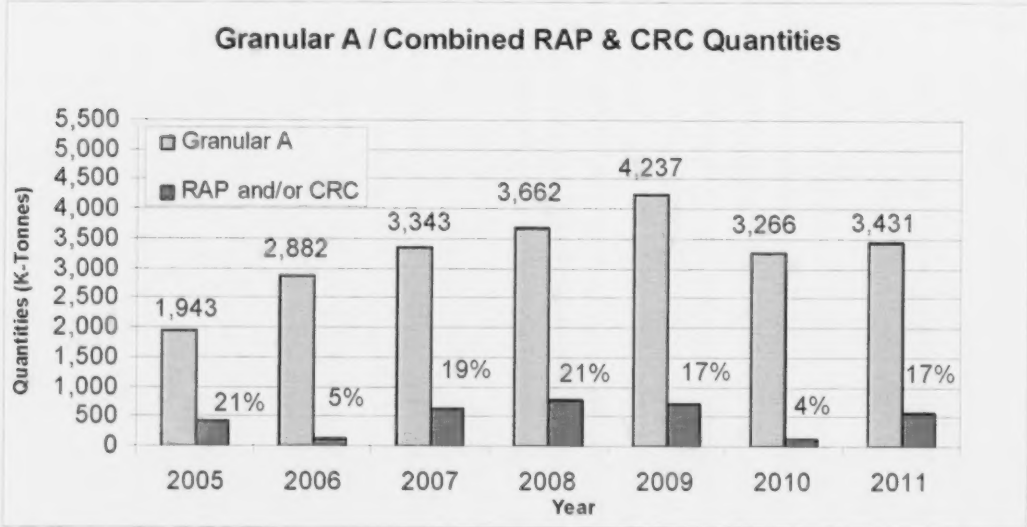
Figure 6:



The vast majority of recycled/reclamined materials (576 kilotonnes) or 90.7% were used in Granular A during the 2011 construction season. The remainder was used in Granular B1 and BII.

RAP and/or CRC represented about 17% of the Granular A used by MTO in 2011. As shown in Figure 7, the proportion of RAP and/or CRC used in Granular A has ranged from 4 to 20% between 2005 and 2011 with the average being about 15% over those years.

Figure 7:



4.4 – Acceptance of Granular Aggregates

Granular aggregates used for road base and subbase materials are sampled after placement and prior to compaction. For older carry-over contracts containing SSP 110S13 (August, 2007), such materials were tested and accepted on the basis of a lot system according to the following schedule:

i) One lot consisting of the first 5,000 tonnes delivered to the work;
ii) A 5,000 tonne lot selected from within the next 15,000 tonnes of delivered material;
iii) A 7,500 tonne lot selected from within the next 30,000 tonnes of delivered material; and.
iv) A 10,000 tonne lot selected from within each 50,000 tonnes of delivered material thereafter.

The lot schedule continued as presented above as long as the lots being tested were found to be acceptable. However, if at some point during the contract, a lot was not accepted at full price, then the lot schedule reverted back to 5,000 tonne lots and the lot sizes were only allowed to increase when two consecutive 5,000 tonne lots are accepted at full price. So the quantity of material within the lots being tested was almost always be less than the actual quantity being placed on a contract.

However, since 2010, a revised lot system was developed to ensure that that the quantity of material being tested is the same as the quantity being placed. So a new version of SSP 110S13 (May, 2010) was created which is now being included in all new contracts and the majority of the contracts being summarized in this report.
In this new version, granular materials are tested and accepted on the basis of a lot system according to

the following schedule:

i) For quantities of up to 5,000 tonnes delivered to the work (i.e. but sampling and tested may be waived for less than 1000 tonnes): One lot;
ii) For quantities of Granular A, O and M greater than 5000 tonnes delivered to the work: 5,000 tonne lots for the first 20,000 tonnes and 10,000 tonne lots thereafter;
iii) For quantities of Granular BI, BII, BIII and SSM greater than 5000 tonnes delivered to the work: 10,000 tonne lots for the first 20,000 tonnes and 20,000 tonne lots thereafter.

In any case, regardless of the lot system being used, each lot is divided into four equal sublots and a sample is randomly obtained from each sublot for testing. The mean and range of the percent passing for the four sublots on each sieve in a gradation test (and % crushed for Granular A only) forms the main basis for acceptance of the lot.

Physical property testing (such as micro-Deval and freeze-thaw) is also done for acceptance. However, since the material for these tests is accepted on a pass/fail basis, these tests are not used for production testing and, as such, were not dealt with in this report.

If the mean and range for gradation (and for Granular A, % crushed) within a tested lot is found to be acceptable, then all of the material within that lot is accepted and is paid for at full price. However, if the granular aggregate does not meet these requirements, adjustment points are accrued and the lot that was tested is paid for at an adjusted (i.e. reduced) price. Depending upon the particular granular material involved, when adjustment points reach a specific value, the lot is rejectable.

Before the lot is given an adjusted price, the Contractor has the option of going to referee testing. The results of such testing are always binding on both parties. The results that the Soils and Aggregates Section received usually include the results for any referee testing that may have been conducted.

Table 3 shows a summary of the total quantities of each different granular aggregate placed, the number of lots and the associated quantities that were tested in 2011, as well as the number of lots, the associated quantities, and the percentages of the totals that were accepted at full price, accepted with an adjusted price, or were rejected. The Provincial data is summarized on the basis of all of the QA Granular Summary Sheets that were received by the Soils and Aggregates Section for construction carried out in 2011. Detailed summaries for each of MTO's five regions are given in Appendices C and D.

Table 3: Lot Summary and Disposition of Each Lot of Granular Aggregate Tested by MTO in 2011 (Quantities in kilotonnes)

	Granular Aggregate Type							Provincial Totals
	O	A	M	BI	BII	BIII	SSM	
Total Qty. Placed	39	3431	0	1448	838	346	515	**6617**
# of Lots Tested	7	384	0	86	60	26	31	**594**
Total Qty. Tested	39	2184	0	855	669	196	254	**4197**
(% placed)	(100.0)	(63.7)	()	(59.1)	(79.8)	(56.7)	(49.3)	**(63.4)**
# of Lots Accepted at Full Price	4	300	0	83	57	24	29	**497**
(% tested)	(57.1)	(78.1)	()	(96.5)	(95.0)	(92.3)	(93.5)	**(83.7)**
Qty. Within Tested Lots Accepted at Full Price	23	1731	0	833	635	186	234	**3642**
(% tested)	(59.0)	(79.3)	()	(97.4)	(94.9)	(94.9)	(92.1)	**(86.8)**
Qty. Actually Accepted at Full Price	23	2978	0	1426	804	336	495	**6062**
(% placed)	(59.0)	(86.8)	()	(98.5)	(95.9)	(97.1)	(96.1)	**(91.60)**
# of Lots Accepted at Adjusted Price	3	84	0	3	3	2	2	**97**
(% tested)	(42.9)	(21.9)	()	(3.5)	(5.0)	(7.7)	(6.5)	**(16.3)**
Qty. Within Tested Lots Accepted at an Adjusted Price	16	453	0	22	34	10	20	**555**
(% tested/% placed)	(41.0/ 41.0)	(20.7/ 13.2)	()	(2.6/ 1.5)	(5.1/ 4.1)	(5.1/ 2.9)	(7.9/ 3.9)	**(13.2/ 8.4)**
# of Lots Rejected	0	0	0	0	0	0	0	**0**
(% tested)	()	()	()	()	()	()	()	**()**
Qty. Rejected	0	0	0	0	0	0	0	**0**
(% tested)	()	()	()	()	()	()	()	**()**

As Table 3 shows, a total of 594 lots representing approximately 4.20 million-tonnes of granular aggregates were tested on MTO contracts. This represents 63.4% of the total quantity that was placed.

Overall, 83.7% of the lots that were tested were accepted at full price. However, since 36.6% of the material that was placed was not tested and, under the older system (which many of the contracts were still using), untested material is accepted at full price, 91.6% of the granular material that was placed was actually accepted at full price. The results also indicate that, on average, 13.2% of the material within the tested lots was accepted with an adjusted price (8.4% based on the total quantity placed).

It should be noted that, since the lot/sublot acceptance system has changed and MTO is no longer

accepting untested material at full price, the overall percentage of price-adjusted material being accepted at full price has decreased by about 3% since 2010.

For the three types of Granular B, between 94.9% and 97.4% of the total quantity tested was accepted at full price (95.9% to 98.5% based on the total quantity placed). However, only 79.3% of the Granular A tested (86.8% of the total quantity placed) was accepted at full price. This represents a fairly significant amount (i.e. 453 kilotonnes) of price-adjusted material or 81.6% of the total.

The details of each individual sieve where the adjustment points were accrued on a Provincial basis are given in Tables 4 to 7 for all seven granular aggregate materials (i.e. although no Granular M was actually placed in 2011). All of these tables are based on weighted averages of the mean, range, and total payment adjustment factors.

For instance, in Table 4, the weighted averages for each sieve were determined by summing up the adjustment points accrued on that sieve multiplied by the tonnage tested for all contracts using the same granular material and then dividing that number by the total tonnage tested across the province. Table 5 represents similar data but it is weighted on the basis of the total tonnage placed. Figure 8 presents the data from these two tables in bar chart form and graphically shows the sieves where the payment adjustments were the most prevalent.

Tables 6, 7, and Appendix E are very similar to Tables 4, 5, and Figure 8, respectively, except that the weighted averages are based on the average payment adjustments in ¢/tonne. In this case, the weighted averages from Tables 4 and 5 are combined with the following prices for the various granular aggregate types:

Granular A, O, and M:	$14.00 per tonne;
Granular BII:	$12.00 per tonne;
Granular BI and BIII:	$10.00 per tonne; and
SSM:	$8.00 per tonne

The prices given above that have been taken from SSP 110S13, May 2010. It should be noted that these are average prices and may not necessarily reflect the actual prices paid for these aggregates for the granular materials used during the 2011 construction season. As such Tables 6, 7 and Appendix E are shown for demonstration purposes only.

Table 4: Weighted Average Payment Adjustment Factors of Granular Materials Based on Lot Quantities Tested in 2011

	Granular O			Granular A			Granular BI			Granular BII			Granular BIII			Granular M			SSM		
Sieve (mm)	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total
150							0.00	0.00	0.00				0.01	0.00	0.01				0.00	0.00	0.00
106.0										0.00	0.00	0.00									
37.5	0.01	0.00	0.01																		
26.5	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.25	0.25	0.31	0.00	0.31				0.00	0.00	0.00
19.0	0.00	0.81	0.81	0.00	0.02	0.02										0.00	0.00	0.00			
13.2	0.05	0.00	0.05	0.01	0.02	0.02										0.00	0.00	0.00			
9.5	1.17	0.00	1.17	0.08	0.09	0.17							0.00	0.00	0.00	0.00	0.00	0.00			
4.75	0.32	0.00	0.32	0.52	0.10	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.18	0.00	0.00	0.00	0.02	0.01	0.03	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3				0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.15																			0.00	0.00	0.00
0.075	0.00	0.00	0.00	0.10	0.02	0.13	0.05	0.00	0.05	0.02	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.37	0.38
Total	1.55	0.81	2.36	0.73	0.26	0.99	0.05	0.01	0.06	0.03	0.25	0.28	0.32	0.00	0.32	0.00	0.00	0.00	0.00	0.37	0.38

Table 5: Weighted Average Payment Adjustment Factors of Granular Materials Based on Quantities Placed in 2011

	Granular O			Granular A			Granular BI			Granular BII			Granular BIII			Granular M			SSM		
Sieve (mm)	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total
150							0.00	0.00	0.00				0.00	0.00	0.00				0.00	0.00	0.00
106.0										0.00	0.00	0.00									
37.5	0.01	0.00	0.01																		
26.5	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.20	0.20	0.17	0.00	0.17				0.00	0.00	0.00
19.0	0.00	0.81	0.81	0.00	0.01	0.01										0.00	0.00	0.00			
13.2	0.05	0.00	0.05	0.00	0.01	0.01										0.00	0.00	0.00			
9.5	1.17	0.00	1.17	0.05	0.06	0.11							0.00	0.00	0.00	0.00	0.00	0.00			
4.75	0.32	0.00	0.32	0.33	0.06	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.18	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.15																			0.00	0.00	0.00
0.075	0.00	0.00	0.00	0.07	0.01	0.08	0.03	0.00	0.03	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.19
Total	1.55	0.81	2.36	0.47	0.17	0.63	0.03	0.00	0.03	0.02	0.20	0.23	0.18	0.00	0.18	0.00	0.00	0.00	0.00	0.18	0.19

Table 6: Weighted Average Payment Reduction of Granular Materials Based on Lot Quantities Tested in 2011 (c/tonne)

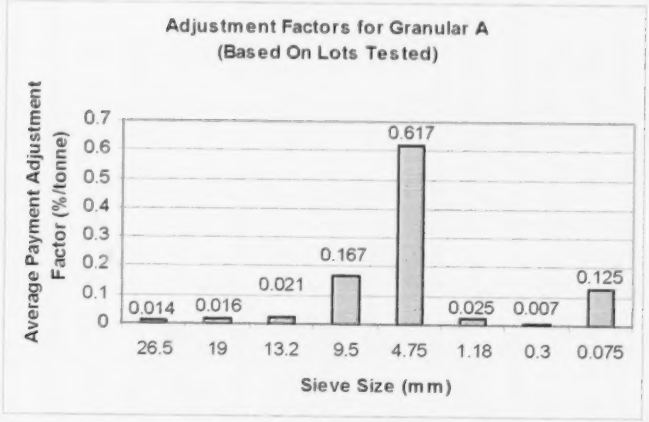
	Granular O			Granular A			Granular BI			Granular BII			Granular BIII			Granular M			SSM		
Sieve (mm)	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total
150							0.01	0.00	0.01				0.07	0.00	0.07				0.00	0.00	0.00
106.0										0.00	0.00	0.00									
37.5	0.18	0.00	0.18																		
26.5	0.00	0.00	0.00	0.11	0.09	0.20	0.00	0.00	0.00	0.00	3.06	3.06	3.06	0.00	3.06				0.00	0.00	0.00
19.0	0.00	11.37	11.37	0.00	0.22	0.22										0.00	0.00	0.00			
13.2	0.63	0.00	0.63	0.07	0.22	0.29										0.00	0.00	0.00			
9.5	16.37	0.00	16.37	1.08	1.26	2.34							0.00	0.00	0.00	0.00	0.00	0.00			
4.75	4.55	0.00	4.55	7.26	1.38	8.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.18	0.00	0.00	0.00	0.26	0.09	0.35	0.00	0.00	0.00	0.06	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3				0.03	0.08	0.10	0.00	0.07	0.07	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.15																			0.00	0.00	0.00
0.075	0.00	0.00	0.00	1.45	0.31	1.76	0.47	0.00	0.47	0.27	0.00	0.27	0.07	0.00	0.07	0.00	0.00	0.00	0.03	2.99	3.03
Total	21.73	11.37	33.09	10.25	3.65	13.90	0.48	0.07	0.56	0.35	3.06	3.40	3.20	0.00	3.20	0.00	0.00	0.00	0.03	2.99	3.03

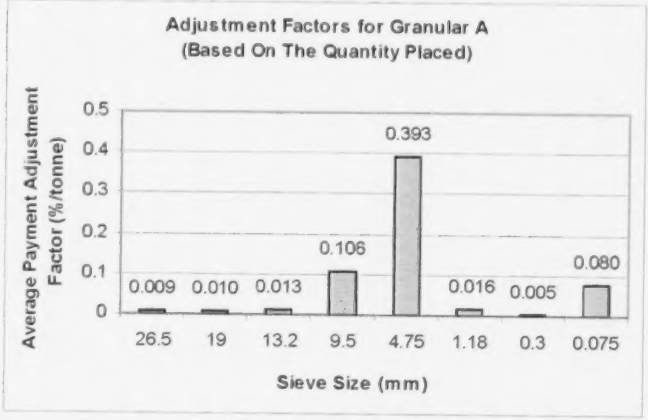
Table 7: Weighted Average Payment Reduction of Granular Materials Based on Total Quantities Placed in 2011 (c/tonne)

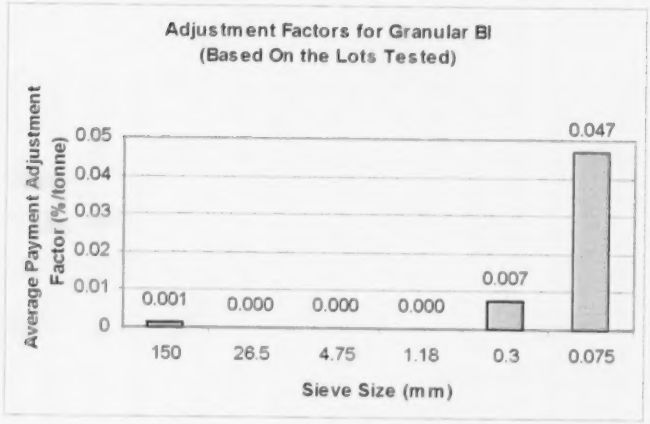
	Granular O			Granular A			Granular BI			Granular BII			Granular BIII			Granular M			SSM		
Sieve (mm)	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total	Mean	Range	Total
150							0.01	0.00	0.01				0.04	0.00	0.04				0.00	0.00	0.00
106.0										0.00	0.00	0.00									
37.5	0.18	0.00	0.18																		
26.5	0.00	0.00	0.00	0.07	0.06	0.12	0.00	0.00	0.00	0.00	2.44	2.44	1.73	0.00	1.73				0.00	0.00	0.00
19.0	0.00	11.37	11.37	0.00	0.14	0.14										0.00	0.00	0.00			
13.2	0.63	0.00	0.63	0.04	0.14	0.18										0.00	0.00	0.00			
9.5	16.37	0.00	16.37	0.69	0.80	1.49							0.00	0.00	0.00	0.00	0.00	0.00			
4.75	4.55	0.00	4.55	4.62	0.88	5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.18	0.00	0.00	0.00	0.17	0.06	0.22	0.00	0.00	0.00	0.05	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3				0.02	0.05	0.07	0.00	0.04	0.04	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.15																			0.00	0.00	0.00
0.075	0.00	0.00	0.00	0.92	0.20	1.12	0.28	0.00	0.28	0.21	0.00	0.21	0.04	0.00	0.04	0.00	0.00	0.00	0.02	1.47	1.49
Total	21.73	11.37	33.09	6.53	2.32	8.85	0.28	0.04	0.33	0.28	2.44	2.72	1.81	0.00	1.81	0.00	0.00	0.00	0.02	1.47	1.49

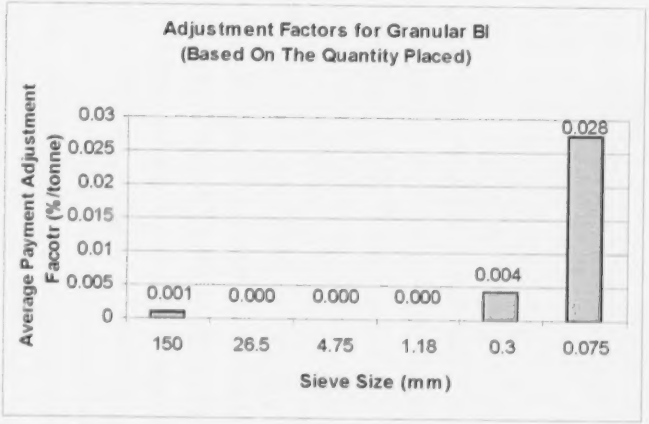
Based on the lots tested, the largest weighted average payment adjustment factor for Granular A was accrued on the 4.75 mm sieve (i.e. 0.617) while for Granular BI, the largest adjustment factors were only accrued on the 0.075 mm sieve. There were also significant payment adjustments on the 26.5 mm sieve for both Granular BII (0.254) and BIII (0.306). Although only 39 kilotonnes of Granular O were placed, there were adjustment points accrued on several sieves, with the largest number of adjustment points being accrued on the 9.5 mm sieve (1.169), based on the lots tested.

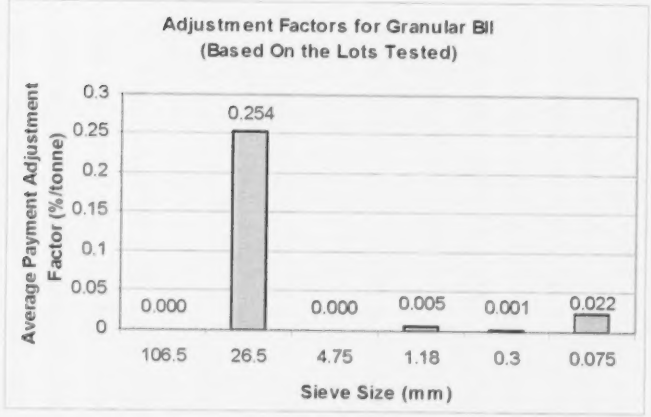
Figure 8: Weighted Average Payment Adjustment Factors for Granular Materials for all MTO Regions in 2011

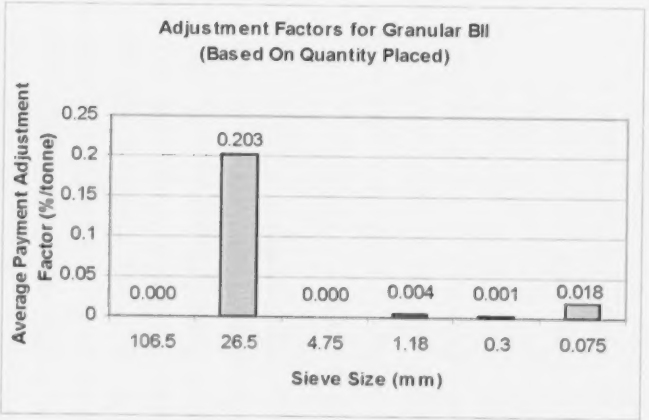


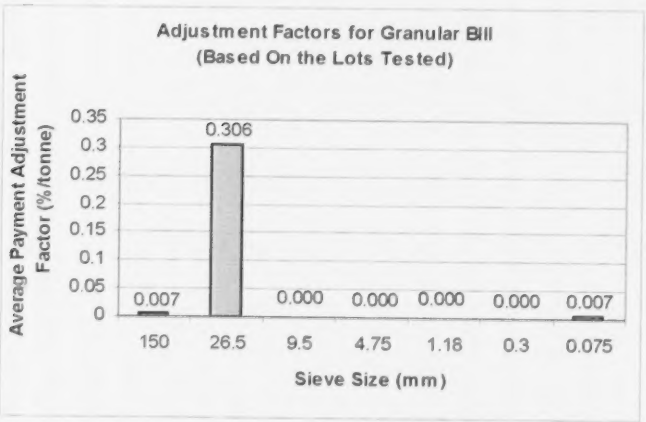


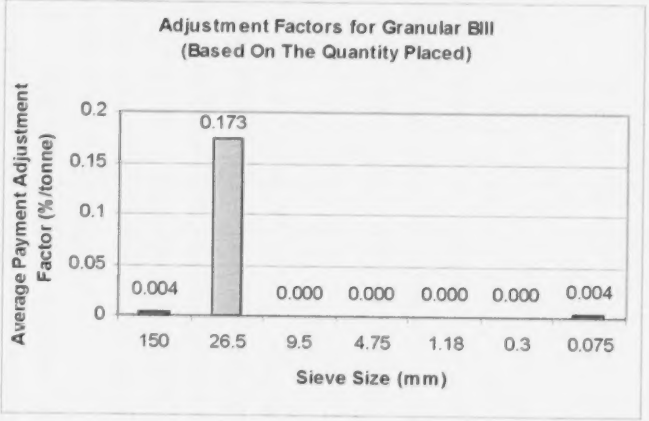


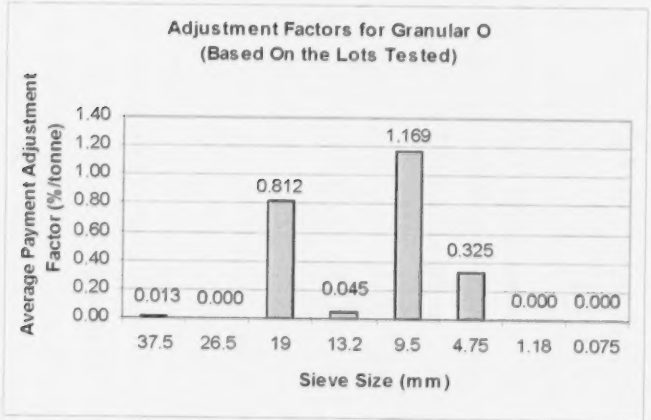


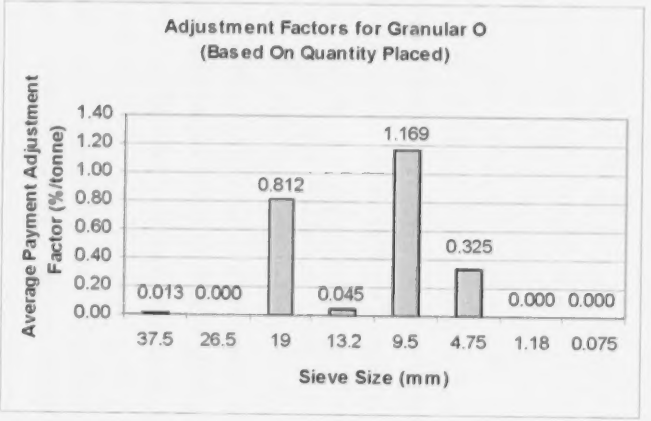

Adjustment Factors for Granular BII
(Based On the Lots Tested)
Average Payment Adjustment Factor (%/tonne)
0.3
0.25
0.2
0.15
0.1
0.05
0
0.000
0.254
0.000
0.005
0.001
0.022
106.5
26.5
4.75
1.18
0.3
0.075
Sieve Size (mm)

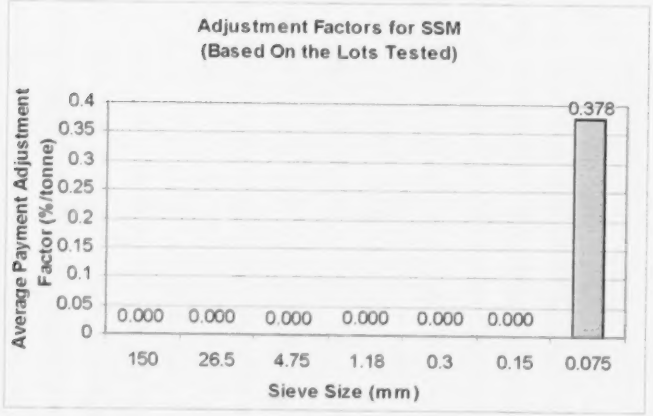

Adjustment Factors for Granular BII
(Based On Quantity Placed)
Average Payment Adjustment Factor (%/tonne)
0.25
0.2
0.15
0.1
0.05
0
0.000
0.203
0.000
0.004
0.001
0.018
106.5
26.5
4.75
1.18
0.3
0.075
Sieve Size (mm)

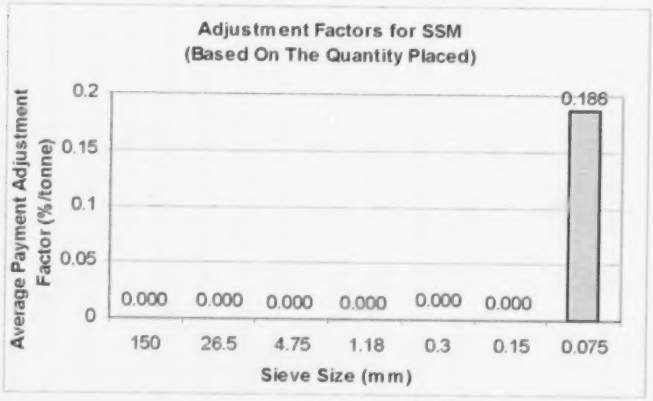

Adjustment Factors for Granular BIII
(Based On the Lots Tested)
Average Payment Adjustment Factor (%/tonne)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0.007
0.306
0.000
0.000
0.000
0.000
0.007
150
26.5
9.5
4.75
1.18
0.3
0.075
Sieve Size (mm)


Adjustment Factors for Granular BIII
(Based On The Quantity Placed)
Average Payment Adjustment Factor (%/tonne)
0.2
0.15
0.1
0.05
0
0.004
0.173
0.000
0.000
0.000
0.000
0.004
150
26.5
9.5
4.75
1.18
0.3
0.075
Sieve Size (mm)


Adjustment Factors for Granular O
(Based On the Lots Tested)
Average Payment Adjustment Factor (%/tonne)
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.013
0.000
0.812
0.045
1.169
0.325
0.000
0.000
37.5
26.5
19
13.2
9.5
4.75
1.18
0.075
Sieve Size (mm)


Adjustment Factors for Granular O
(Based On Quantity Placed)
Average Payment Adjustment Factor (%/tonne)
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.013
0.000
0.812
0.045
1.169
0.325
0.000
0.000
37.5
26.5
19
13.2
9.5
4.75
1.18
0.075
Sieve Size (mm)





The overall average number of adjustment points being accrued on granular aggregates that were tested by MTO represents a total reduced immediate capital expenditure to the ministry of approximately $358,000 in 2010 based on the aggregate prices that were assumed in these analyses.

It should be noted that, since only 63.4% of the material placed was actually tested, the reduced immediate cost to MTO may have been significantly higher, assuming that the untested material is of similar quality to the tested material and that the relative cost to do the additional testing is also similar.

5.0 - Summary

Based on the 142 contract QA Granular Summary Sheets received by the Soils and Aggregates Section, the granular materials placed by MTO during the 2011 construction season can be summarized by the following:

1. A total of 6.62 million tonnes of granular aggregates were placed by MTO in 2011.
2. Of the total granular aggregates placed, the majority was placed in Northeastern and Central Regions (i.e. 46.4% and 18.3%, respectively).
3. Approximately 90.4%, or 5.98 million tonnes, of the granular aggregates placed were derived from natural sources (i.e. from pits or produced from crushed rock) while 9.6% came from RAP or RCM.
4. Of the 5.98 million tonnes of natural granular aggregates placed, 76.7% came from commercial sources, 16.1% came from came from non-commercial (i.e. unlicensed) sources and 7.2% from materials obtained within the right-of-way.
5. Granular A and B (Types I, II, and III) represented 51.9% and 39.8%, respectively, of the total quantity of granular aggregates placed.
6. Almost all (i.e. 88.5%) of the recycled/reclaimed materials used by MTO in granular aggregates were placed in Central and West Regions.
7. Of the 6.62 million tonnes of granular aggregates placed, approximately 63.4% or 4.208 million tonnes of the material was tested which represented a total of 594 lots.
8. Overall, 91.6% of the material placed was accepted at full price and 8.4% of the material was accepted at an adjusted price.
9. Granular 0 had the most quality-related issues, with 41% of the lots tested receiving payment adjustments. For Granular A, 20.7% of the lots received price adjustment while a total of 38.4% of the lots tested from each of the three types of Granular B (Types I, II, and II) received payment adjustments.
10. Payment adjustments amounted to approximately $358,000 in 2011.

6.0 - Acknowledgements

The Soils and Aggregates Section would like to acknowledge the Soils and Aggregates Quality Assurance Officers in each of the five Regional Quality Assurance Sections, who assembled and provided the QA Granular Summary Sheets and most of the other data that was used for these analyses. We would also like to acknowledge Mr. Jessie Grewal for assembling the granular summaries and helping to synthesize the data that was used in this report.

7.0 - References

MTO "Aggregates for Granular O, A, B, M and Select Subgrade Materials", Special Provision No. 110S13, Ministry of Transportation, August 2007.
MTO "Aggregates for Granular O, A, B, M and Select Subgrade Materials", Special Provision No. 110S13, Ministry of Transportation, May 2010.

Appendix A: Sources of Granular Aggregates Used by Each MTO Region During 2011

Granular A

Source	Kilotonnes					
	Region					Provincial Totals
	C	W	E	NE	NW	
Commercial Source	197	392	339	956	222	2105
Non-Commercial Source	0	12	18	427	98	555
Material from Right of Way	0	0	0	188	8	196
Total Natural Aggregate	197	403	357	1570	328	2855
RAP	39.4	103.1	0.0	59.9	9.4	211.9
RCM	360.6	0.0	0.0	0.0	0.0	360.6
Glass/Ceramics	0.0	0.0	0.0	0.0	0.0	0.0
Other Recycled/Reclaimed Material	0.0	0.0	0.0	3.4	0.0	3.4
Total Recycled/Reclaimed Materials	400.0	103.1	0.0	63.4	9.4	575.9

Granular BI

Source	Kilotonnes					
	Region					Provincial Totals
	C	W	E	NE	NW	
Commercial Source	519	0	2	668	0	1189
Non-Commercial Source	0	0	0	208	0	208
Material from Right of Way	0	0	0	0	0	0
Total Natural Aggregate	519	0	2	876	0	1397
RAP	10.4	0.0	0.0	0.0	0.0	10.4
RCM	41.0	0.0	0.0	0.0	0.0	41.0
Glass/Ceramics	0.0	0.0	0.0	0.0	0.0	0.0
Other Recycled/Reclaimed Material	0.0	0.0	0.0	0.4	0.0	0.4
Total Recycled/Reclaimed Materials	51.4	0.0	0.0	0.4	0.0	51.8

Granular BII

Source	Kilotonnes					
	Region					Provincial Totals
	C	W	E	NE	NW	
Commercial Source	43	75	157	62	227	563
Non-Commercial Source	0	0	0	49	0	49
Material from Right of Way	0	0	0	76	149	225
Total Natural Aggregate	43	75	157	187	376	837
RAP	N/A	N/A	N/A	N/A	N/A	N/A
RCM	N/A	N/A	N/A	N/A	N/A	N/A
Glass/Ceramics	N/A	N/A	N/A	N/A	N/A	N/A
Other Recycled/Reclaimed Material	N/A	N/A	N/A	N/A	N/A	N/A
Total Recycled/Reclaimed Materials	N/A	N/A	N/A	N/A	N/A	N/A

Granular BIII

Source	Kilotonnes					
	Region					Provincial Totals
	C	W	E	NE	NW	
Commercial Source	0	204	109	0	13	325
Non-Commercial Source	0	0	0	0	0	0
Material from Right of Way	0	12	0	0	0	12
Total Natural Aggregate	0	216	109	0	13	338
RAP	0.0	7.5	0.0	0.0	0.0	7.5
RCM	0.0	0.0	0.0	0.0	0.0	0.0
Glass/Ceramics	0.0	0.0	0.0	0.0	0.0	0.0
Other Recycled Material	0.0	0.0	0.0	0.0	0.0	0.0
Total Recycled Materials	0.0	7.5	0.0	0.0	0.0	7.5

Granular O

Source	Kilotonnes					
	Region					Provincial Totals
	C	W	E	NE	NW	
Commercial Source	0	0	39	0	0	39
Non-Commercial Source	0	0	0	0	0	0
Material from Right of Way	0	0	0	0	0	0
Total Natural Aggregate	0	0	39	0	0	39
RAP	N/A	N/A	N/A	N/A	N/A	N/A
RCM	N/A	N/A	N/A	N/A	N/A	N/A
Glass/Ceramics	N/A	N/A	N/A	N/A	N/A	N/A
Other Recycled/Reclaimed Material	N/A	N/A	N/A	N/A	N/A	N/A
Total Recycled/Reclaimed Materials	N/A	N/A	N/A	N/A	N/A	N/A

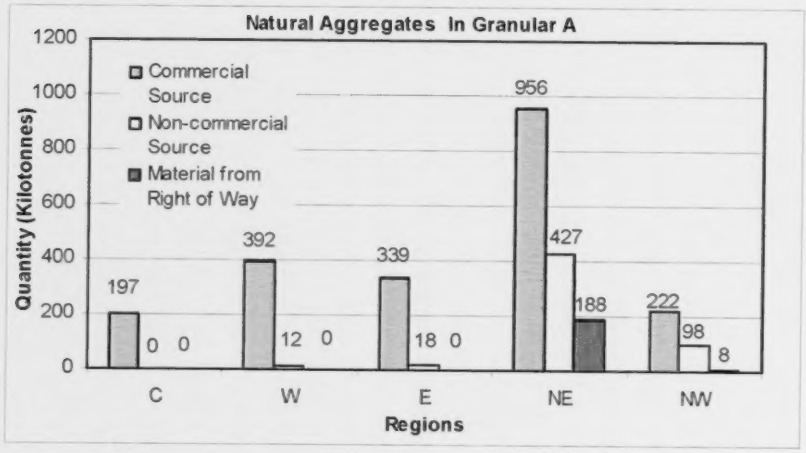
Granular M

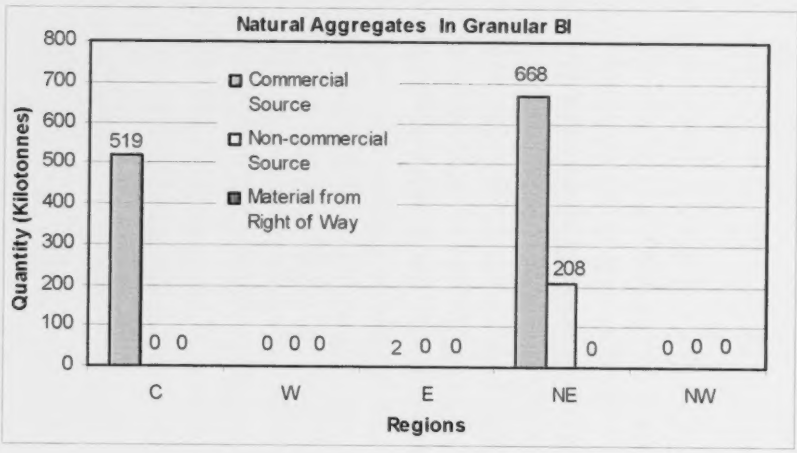
Source	Kilotonnes					
	Region					Provincial Totals
	C	W	E	NE	NW	
Commercial Source	0	0	0	0	0	0
Non-Commercial Source	0	0	0	0	0	0
Material from Right of Way	0	0	0	0	0	0
Total Natural Aggregate	0	0	0	0	0	0
RAP	N/A	N/A	N/A	N/A	N/A	N/A
RCM	N/A	N/A	N/A	N/A	N/A	N/A
Glass/Ceramics	N/A	N/A	N/A	N/A	N/A	N/A
Other Recycled/Reclaimed Material	N/A	N/A	N/A	N/A	N/A	N/A
Total Recycled/Reclaimed Materials	N/A	N/A	N/A	N/A	N/A	N/A

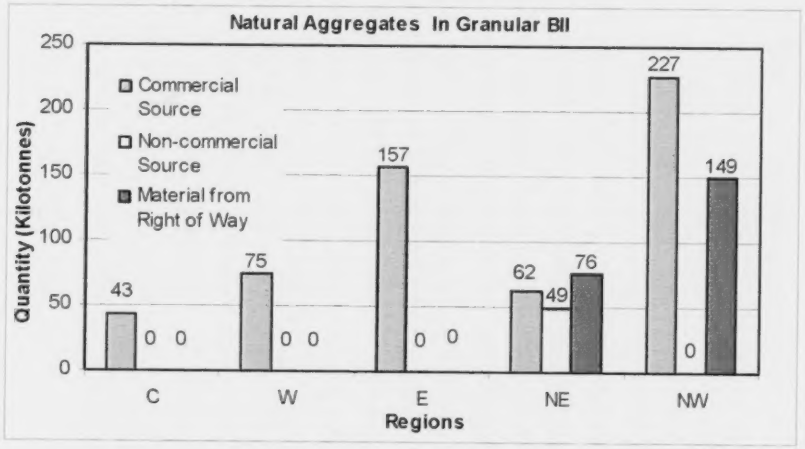
SSM

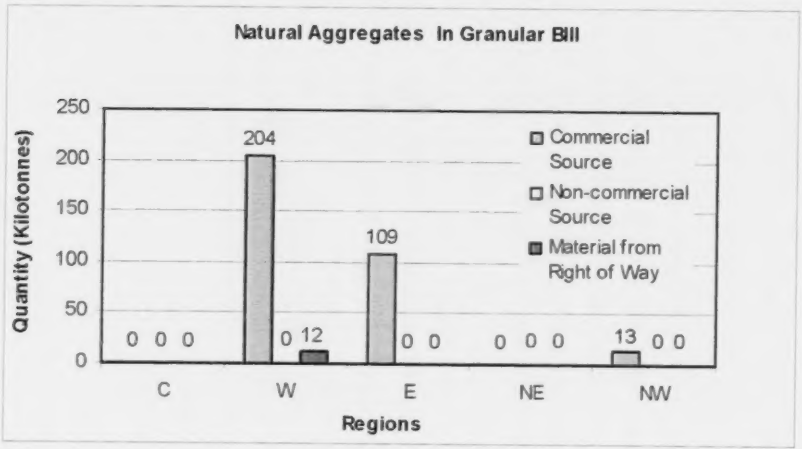
Source	Kilotonnes					
	Region					Provincial Totals
	C	W	E	NE	NW	
Commercial Source	0	0	88	278	0	367
Non-Commercial Source	0	0	0	93	56	149
Material from Right of Way	0	0	0	0	0	0
Total Natural Aggregate	0	0	88	371	56	516
RAP	N/A	N/A	N/A	N/A	N/A	N/A
RCM	N/A	N/A	N/A	N/A	N/A	N/A
Glass/Ceramics	N/A	N/A	N/A	N/A	N/A	N/A
Other Recycled/Reclaimed Material	N/A	N/A	N/A	N/A	N/A	N/A
Total Recycled/Reclaimed Materials	N/A	N/A	N/A	N/A	N/A	N/A

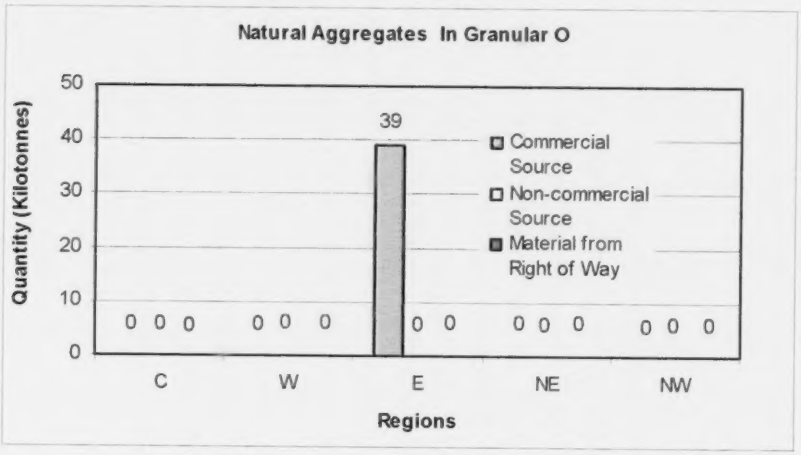
Appendix B: Quantities of Natural Aggregates by Source Used in Granular Aggregates by Each MTO Region in 2011

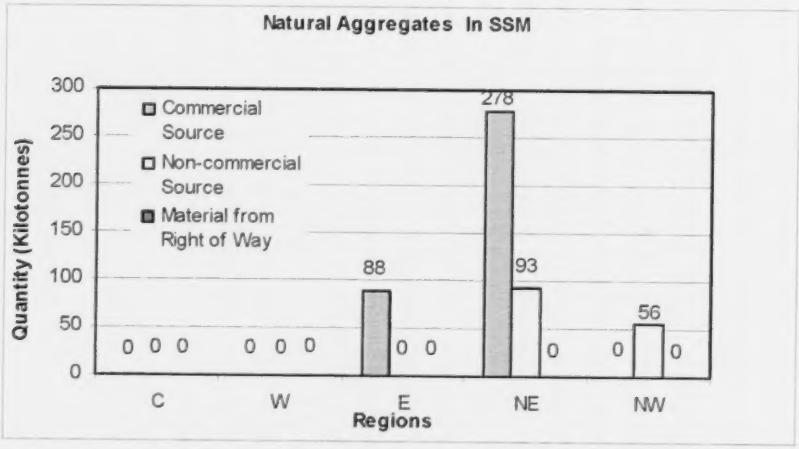





Natural Aggregates In Granular BII
Quantity (Kilotonnes)
250
200
150
100
50
0
Commercial Source
Non-commercial Source
Material from Right of Way
43
0 0
75
0 0
157
0 0
62
49
76
227
0
149
C
W
E
NE
NW
Regions

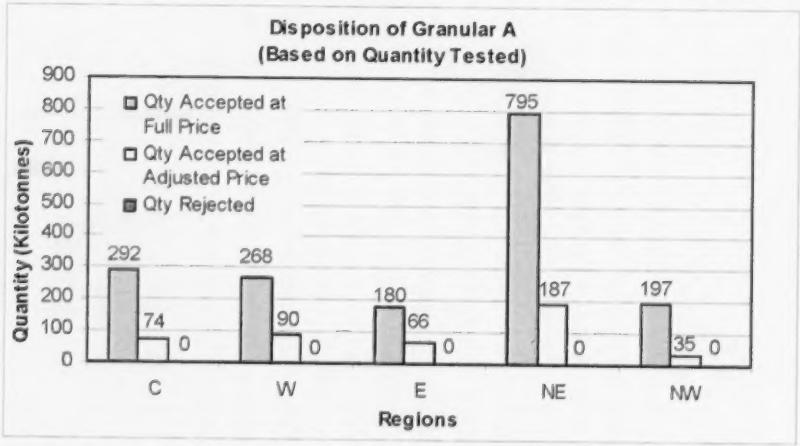

Natural Aggregates In Granular BIII
Quantity (Kilotonnes)
250
200
150
100
50
0
Commercial Source
Non-commercial Source
Material from Right of Way
0 0 0
204
0 12
109
0 0
0 0 0
13 0 0
C
W
E
NE
NW
Regions

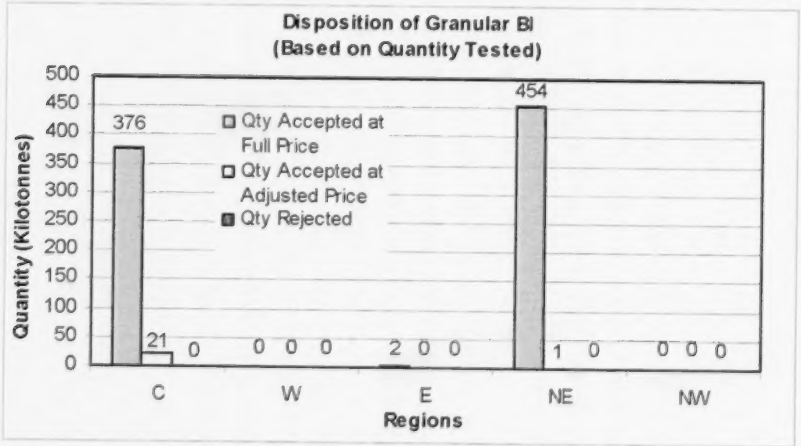

Natural Aggregates In Granular O
Quantity (Kilotonnes)
50
40
30
20
10
0
Commercial Source
Non-commercial Source
Material from Right of Way
0 0 0
0 0 0
39
0 0
0 0 0
0 0 0
C
W
E
NE
NW
Regions

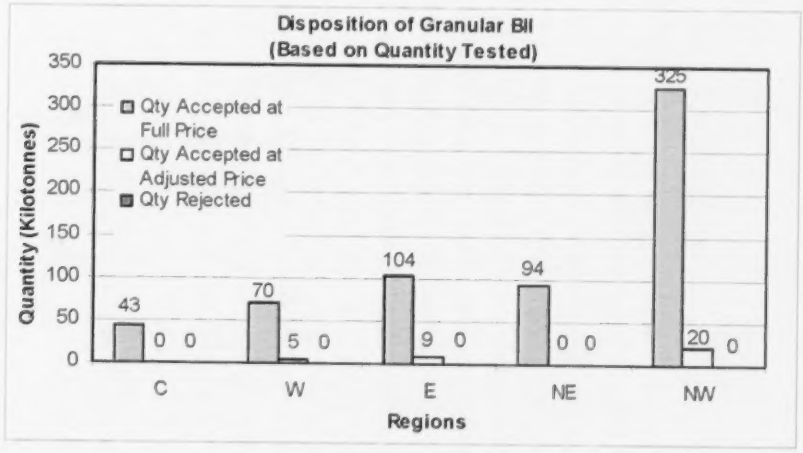

Natural Aggregates In SSM
Quantity (Kilotonnes)
300
250
200
150
100
50
0
Commercial Source
Non-commercial Source
Material from Right of Way
0 0 0
0 0 0
88
0 0
278
93
0
0
56
0
C
W
E
NE
NW
Regions

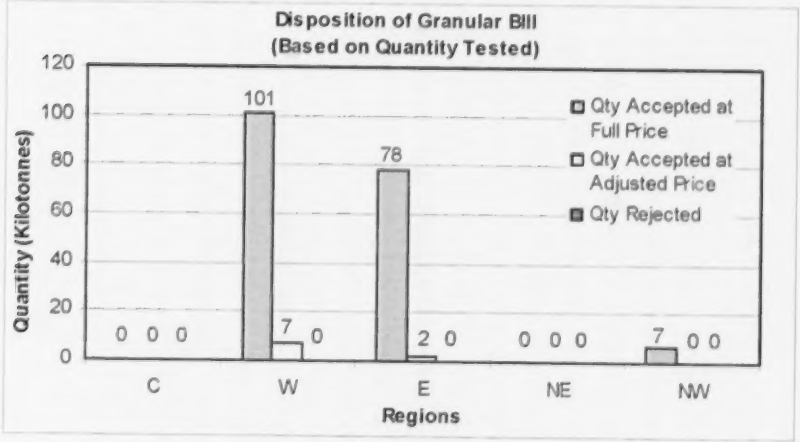
Appendix C: Disposition of QA Lots of Granular Aggregates Tested in Each MTO Region in 2011

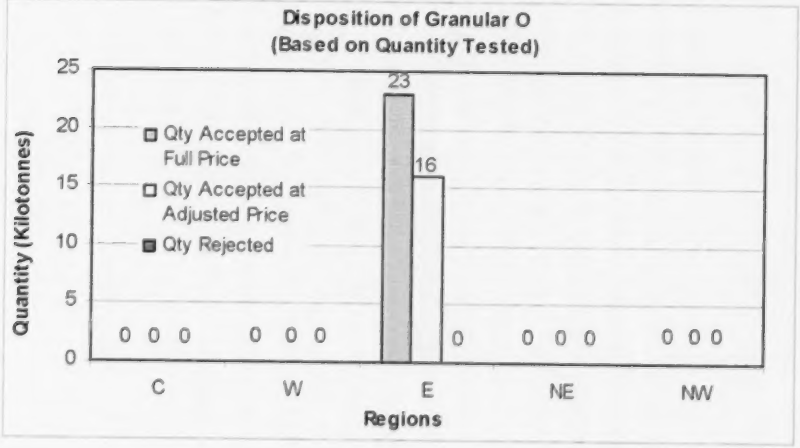
C.1 - DISPOSITION BASED ON QUANTITIES WITHIN THE LOTS TESTED

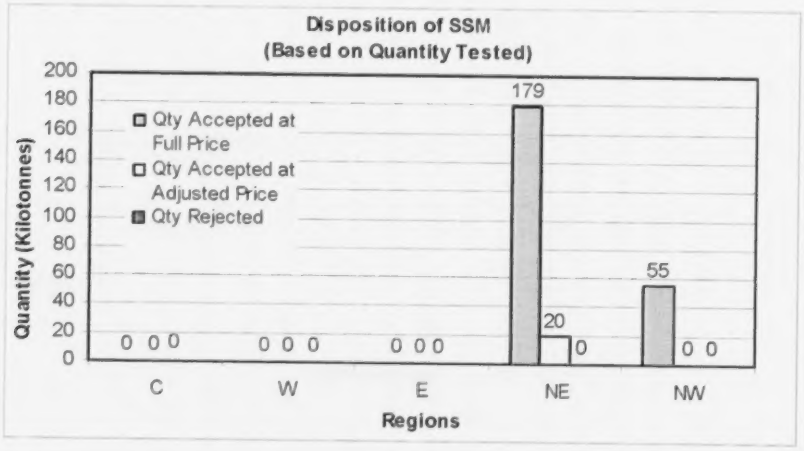




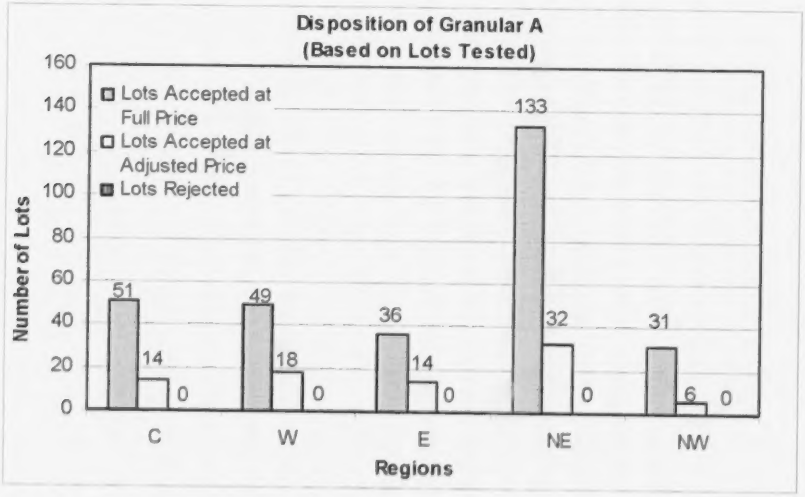

Disposition of Granular BII
(Based on Quantity Tested)
Quantity (Kilotonnes)
350
300
250
200
150
100
50
0
Qty Accepted at Full Price
Qty Accepted at Adjusted Price
Qty Rejected
43
0 0
70
5 0
104
9 0
94
0 0
325
20 0
C
W
E
NE
NW
Regions

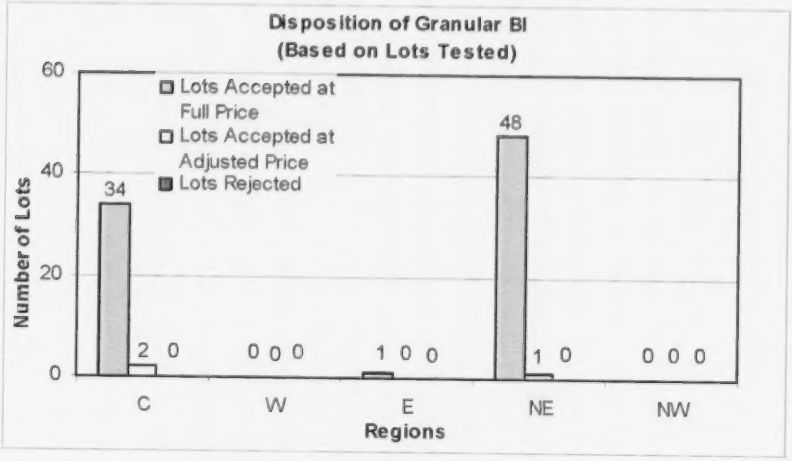

Disposition of Granular BIII
(Based on Quantity Tested)
Quantity (Kilotonnes)
120
100
80
60
40
20
0
Qty Accepted at Full Price
Qty Accepted at Adjusted Price
Qty Rejected
0 0 0
101
7 0
78
2 0
0 0 0
7
0 0
C
W
E
NE
NW
Regions

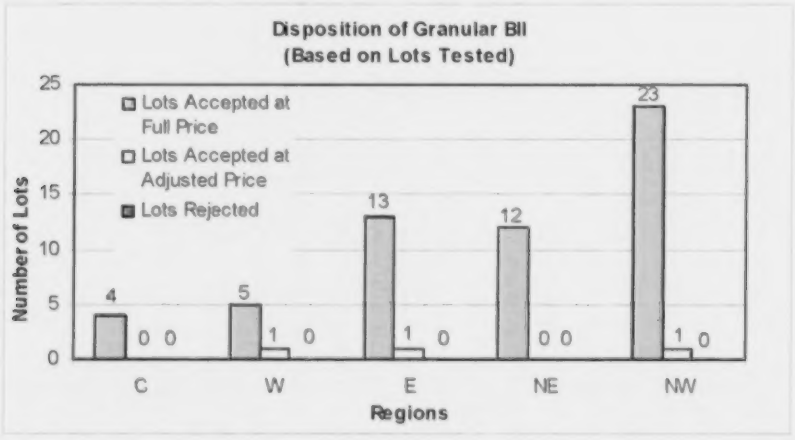

Disposition of Granular O
(Based on Quantity Tested)
Quantity (Kilotonnes)
25
20
15
10
5
0
Qty Accepted at Full Price
Qty Accepted at Adjusted Price
Qty Rejected
0 0 0
0 0 0
23
16
0
0 0 0
0 0 0
C
W
E
NE
NW
Regions

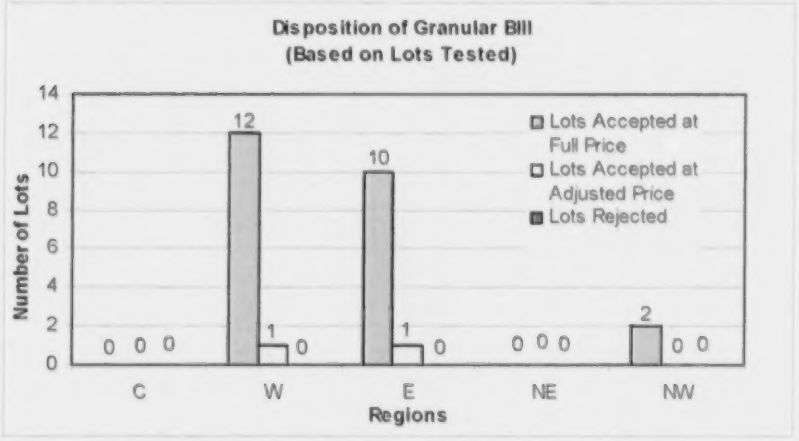

Disposition of SSM
(Based on Quantity Tested)
Quantity (Kilotonnes)
200
180
160
140
120
100
80
60
40
20
0
Qty Accepted at Full Price
Qty Accepted at Adjusted Price
Qty Rejected
0 0 0
0 0 0
0 0 0
179
20
0
55
0 0
C
W
E
NE
NW
Regions

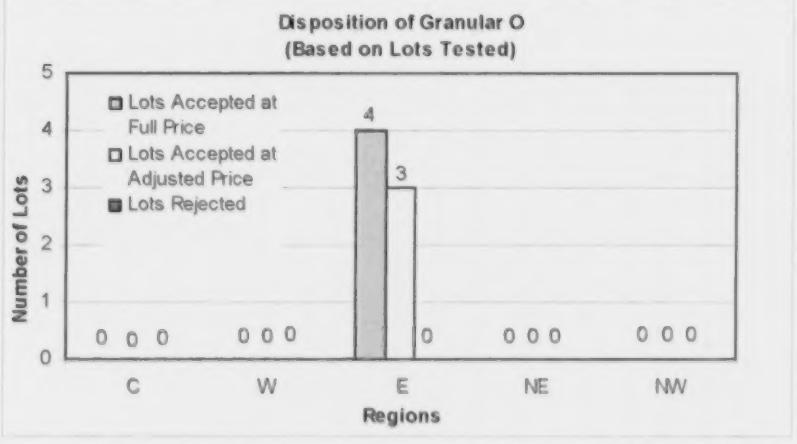
C.2 - DISPOSITION BASED ON NUMBER OF LOTS TESTED

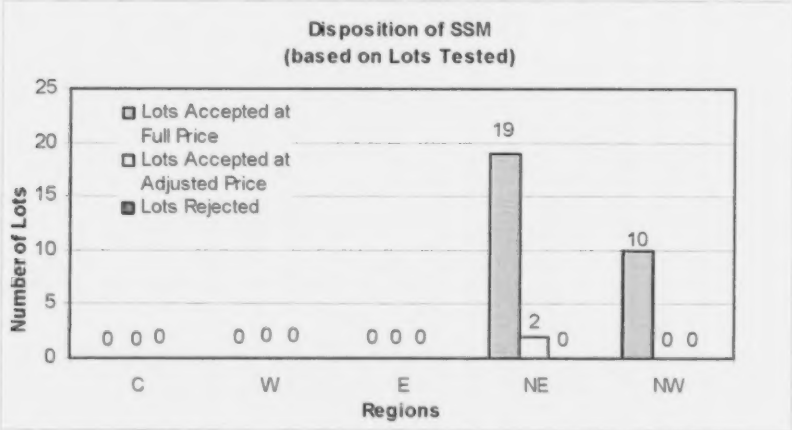





Disposition of Granular BII
(Based on Lots Tested)
Number of Lots
Regions
Lots Accepted at Full Price
Lots Accepted at Adjusted Price
Lots Rejected
C
W
E
NE
NW
4
0 0
5
1 0
13
1 0
12
0 0
23
1 0


Disposition of Granular BIII
(Based on Lots Tested)
Number of Lots
Regions
Lots Accepted at Full Price
Lots Accepted at Adjusted Price
Lots Rejected
C
W
E
NE
NW
0 0 0
12
1 0
10
1 0
0 0 0
2
0 0


Disposition of Granular O
(Based on Lots Tested)
Number of Lots
Regions
Lots Accepted at Full Price
Lots Accepted at Adjusted Price
Lots Rejected
C
W
E
NE
NW
0 0 0
0 0 0
4
3
0
0 0 0
0 0 0


Disposition of SSM
(based on Lots Tested)
Lots Accepted at Full Price
Lots Accepted at Adjusted Price
Lots Rejected
Number of Lots
25
20
15
10
5
0
0 0 0
0 0 0
0 0 0
19
2
0
10
0 0
C
W
E
NE
NW
Regions

Appendix D: Lot Summary of Granular Aggregates Tested by Each Region in 2011

Granular A

Region	C	W	E	NE	NW	Provincial Totals
Lots Tested	65	67	50	165	37	384
Qty Tested (kt)	366	358	246	982	232	2184
Lots Accepted at Full Price	51	49	36	133	31	300
Qty Accepted at Full Price (kt)	292	268	180	795	197	1731
Lots Accepted at Adjusted Price	14	18	14	32	6	84
Qty Accepted at Adjusted Price (kt)	74	90	66	187	35	453
Lots Rejected	0	0	0	0	0	0
Qty Rejected (kt)	0	0	0	0	0	0

Granular BI

Region	C	W	E	NE	NW	Provincial Totals
Lots Tested	36	0	1	49	0	86
Qty Tested (kt)	397	0	2	455	0	855
Lots Accepted at Full Price	34	0	1	48	0	83
Qty Accepted at Full Price (kt)	376	0	2	454	0	833
Lots Accepted at Adjusted Price	2	0	0	1	0	3
Qty Accepted at Adjusted Price (kt)	21	0	0	1	0	22
Lots Rejected	0	0	0	0	0	0
Qty Rejected (kt)	0	0	0	0	0	0

Granular BII

Region	C	W	E	NE	NW	Provincial Totals
Lots Tested	4	6	14	12	24	60
Qty Tested (kt)	43	75	113	94	345	669
Lots Accepted at Full Price	4	5	13	12	23	57
Qty Accepted at Full Price (kt)	43	70	104	94	325	635
Lots Accepted at Adjusted Price	0	1	1	0	1	3
Qty Accepted at Adjusted Price (kt)	0	5	9	0	20	34
Lots Rejected	0	0	0	0	0	0
Qty Rejected (kt)	0	0	0	0	0	0

Granular BIII

Region	C	W	E	NE	NW	Provincial Totals
Lots Tested	0	13	11	0	2	26
Qty Tested (kt)	0	109	80	0	7	196
Lots Accepted at Full Price	0	12	10	0	2	24
Qty Accepted at Full Price (kt)	0	101	78	0	7	186
Lots Accepted at Adjusted Price	0	1	1	0	0	2
Qty Accepted at Adjusted Price (kt)	0	7	2	0	0	10
Lots Rejected	0	0	0	0	0	0
Qty Rejected (kt)	0	0	0	0	0	0

Granular O

Region	C	W	E	NE	NW	Provincial Totals
Lots Tested	0	0	7	0	0	7
Qty Tested (kt)	0	0	39	0	0	39
Lots Accepted at Full Price	0	0	4	0	0	4
Qty Accepted at Full Price (kt)	0	0	23	0	0	23
Lots Accepted at Adjusted Price	0	0	3	0	0	3
Qty Accepted at Adjusted Price (kt)	0	0	16	0	0	16
Lots Rejected	0	0	0	0	0	0
Qty Rejected (kt)	0	0	0	0	0	0

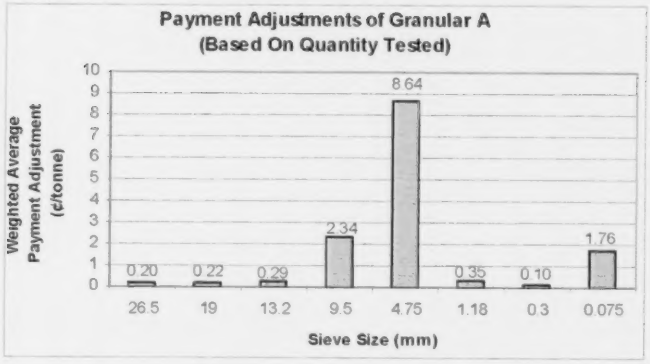
Granular M

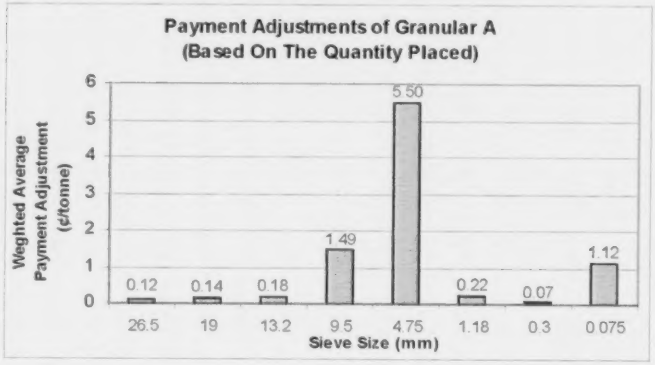
Region	C	W	E	NE	NW	Provincial Totals
Lots Tested	0	0	0	0	0	0
Qty Tested (kt)	0	0	0	0	0	0
Lots Accepted at Full Price	0	0	0	0	0	0
Qty Accepted at Full Price (kt)	0	0	0	0	0	0
Lots Accepted at Adjusted Price	0	0	0	0	0	0
Qty Accepted at Adjusted Price (kt)	0	0	0	0	0	0
Lots Rejected	0	0	0	0	0	0
Qty Rejected (kt)	0	0	0	0	0	0

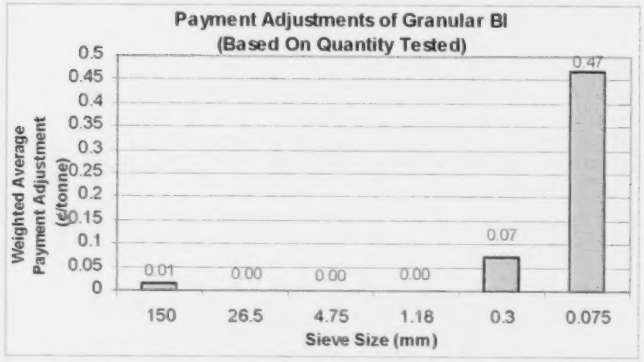
SSM

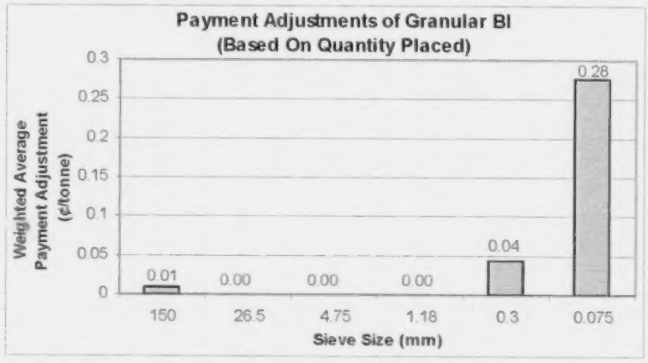
Region	C	W	E	NE	NW	Provincial Totals
Lots Tested	0	0	0	21	10	31
Qty Tested (kt)	0	0	0	199	55	254
Lots Accepted at Full Price	0	0	0	19	10	29
Qty Accepted at Full Price (kt)	0	0	0	179	55	234
Lots Accepted at Adjusted Price	0	0	0	2	0	2
Qty Accepted at Adjusted Price (kt)	0	0	0	20	0	20
Lots Rejected	0	0	0	0	0	0
Qty Rejected (kt)	0	0	0	0	0	0

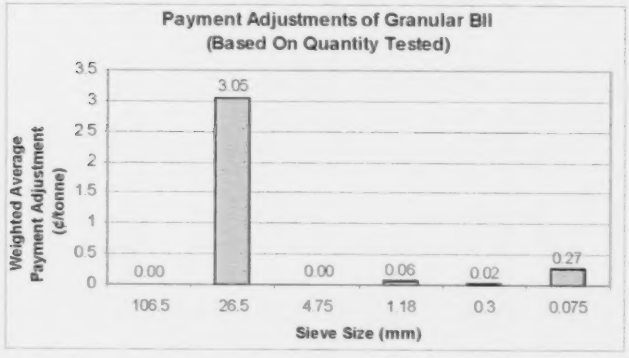
Appendix E: Summary of Weighted Average Payment Adjustments for Quantities Tested and Quantities Placed in 2011 (¢/tonne)

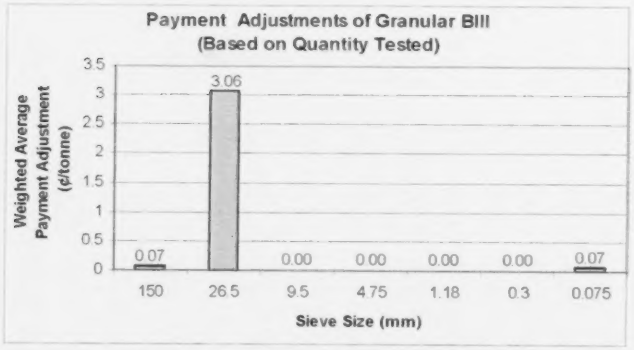


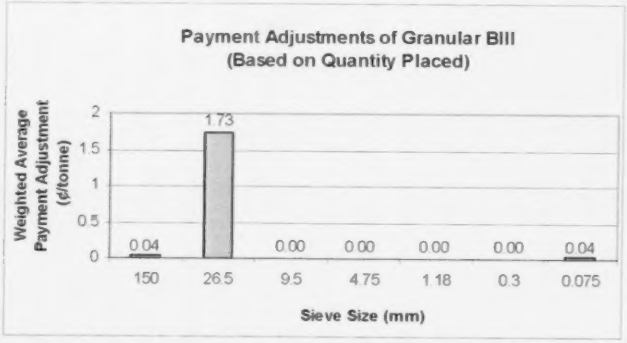


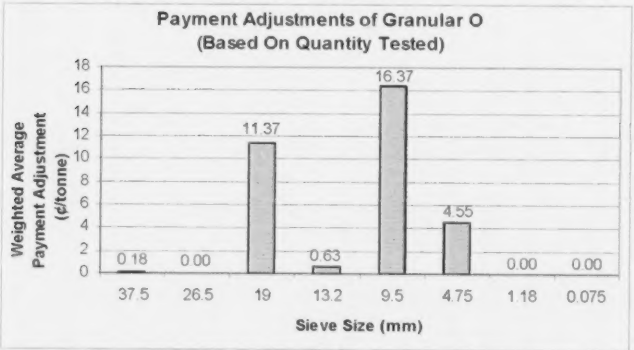


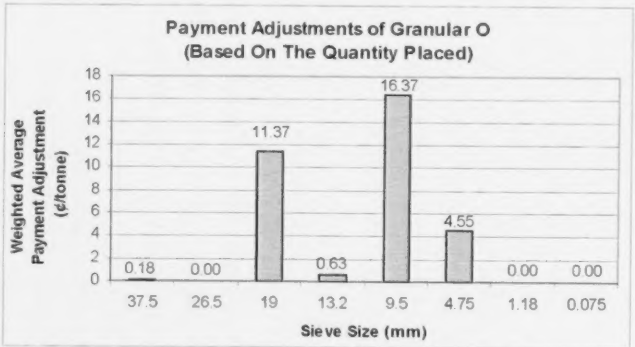


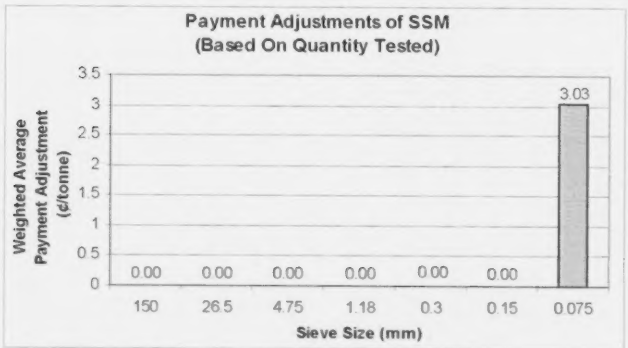


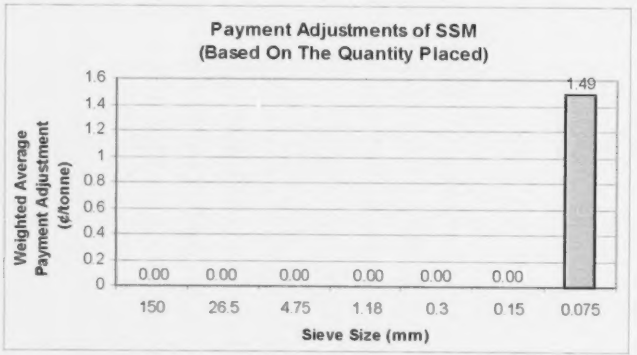

Payment Adjustments of Granular BIII
(Based on Quantity Tested)
Weighted Average Payment Adjustment (¢/tonne)
3.5
3
2.5
2
1.5
1
0.5
0
3.06
0.07
0.00
0.00
0.00
0.00
0.07
150
26.5
9.5
4.75
1.18
0.3
0.075
Sieve Size (mm)


Payment Adjustments of Granular BIII
(Based on Quantity Placed)
Weighted Average Payment Adjustment (¢/tonne)
2
1.5
1
0.5
0
1.73
0.04
0.00
0.00
0.00
0.00
0.04
150
26.5
9.5
4.75
1.18
0.3
0.075
Sieve Size (mm)


Payment Adjustments of Granular O
(Based On Quantity Tested)
Weighted Average Payment Adjustment (¢/tonne)
18
16
14
12
10
8
6
4
2
0
16.37
11.37
4.55
0.18
0.00
0.63
0.00
0.00
37.5
26.5
19
13.2
9.5
4.75
1.18
0.075
Sieve Size (mm)


Payment Adjustments of Granular O
(Based On The Quantity Placed)
Weighted Average Payment Adjustment (¢/tonne)
18
16
14
12
10
8
6
4
2
0
16.37
11.37
4.55
0.18
0.00
0.63
0.00
0.00
37.5
26.5
19
13.2
9.5
4.75
1.18
0.075
Sieve Size (mm)


Payment Adjustments of SSM
(Based On Quantity Tested)
Weighted Average Payment Adjustment (¢/tonne)
3.5
3
2.5
2
1.5
1
0.5
0
3.03
0.00
0.00
0.00
0.00
0.00
0.00
150
26.5
4.75
1.18
0.3
0.15
0.075
Sieve Size (mm)


Payment Adjustments of SSM
(Based On The Quantity Placed)
Weighted Average Payment Adjustment (¢/tonne)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1.49
0.00
0.00
0.00
0.00
0.00
0.00
150
26.5
4.75
1.18
0.3
0.15
0.075
Sieve Size (mm)